Quality of life assessment in physical activity and health promotion.

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Gill, D.L., Chang, Y-K., Murphy, K.M., Speed, K.M., Hammond, C.C., Rodriguez, E.A., Lyu, M., & Shang, Y-T. (2011). Quality of life assessment in physical activity and health promotion. *Applied Research in Quality of Life, 6(2),* 181-200. (DOI 10.1007/s11482-010-9126-2)

Abstract:

Despite the clear relationship of physical activity and quality of life (QoL), QoL measures are seldom targeted for physical activity and health promotion. The current research attempted to address that gap by developing a QoL measure based on a conceptual model that reflects positive health and is relevant for physical activity and health promotion programs. In the project, which extended over three phases, an initial 70-item QoL survey was administered to university students and community program participants (total n = 512) along with measures of satisfaction with life and physical activity. Exploratory and confirmatory factor analyses revealed clear social, emotional, cognitive, physical, spiritual and functional (ADL) QoL factors as well as integrated QoL. The resulting 32-item QoL Survey fits the conceptual model, demonstrates logical relationships with physical activity and has sufficient psychometric properties for use in related research and health promotion programs.

Keywords: physical activity | positive health | assessment | survey development | quality of life

Article:

Professionals and program participants alike cite enhanced quality of life (QoL) as a key benefit of, and motivator for, physical activity. Despite the clear role of QoL in physical activity and health promotion, QoL measures are often conceptually and psychometrically questionable and seldom targeted for health promotion. The ultimate goal of this research is to address that gap by developing a measure of QoL that is reliable, valid and relevant for physical activity and health promotion programs. The specific aims of this study are to develop an initial QoL measure in line with our conceptual framework, examine its structure and psychometric properties, and provide a measure of QoL for use in research and programs that emphasize and monitor QoL to promote lifestyle physical activity and positive health.

Physical Activity and Quality of Life

The health benefits of physical activity in reducing risk for major diseases are well-documented and widely recognized (Kesaniemi et al. 2001; USDHHS 1996), and a growing body of research indicates that physical activity also promotes psychological health and subjective well-being—that is, quality of life (QoL) (e.g., Berger and Tobar 2007; McAuley and Elavsky 2006; Rejeski and Mihalko 2001). Rejeski et al. (1996) who authored a seminal review of physical activity and health-related quality of life (HRQoL), described QoL as a subjective, multidimensional construct and suggested that HRQoL is a more restricted construct, referring to those aspects of QoL related to health. Since the Rejeski et al. (1996) review, the distinction between HRQoL and QoL has blurred and the evidence that physical activity promotes quality of life has continued to accumulate, but QoL assessment has not kept pace.

Within the physical activity and health promotion literature, QoL assessment is a patchwork quilt of measures ranging from integrative subjective well-being to aggregate measures of separate components (e.g., physical function, social and spiritual well-being), and extending to related constructs (e.g., depression) as markers of QoL. For example, positive relationships between physical activity and QoL were found in six studies with samples ranging from frail older adults to population based surveys (Brown, et al. 2003; Lee and Russell 2003; Lustyk et al. 2004; Schechtman and Ory 2001; Schmitz et al. 2004; Stathi et al. 2002). Although the conclusions of these representative studies are consistent, every study cited used a different QoL measure.

As background, a systematic review of the published research on physical activity and QoL from 2001 to 2005 was conducted to identify the current models and measures (Gill et al. 2006). From over 300 citations, 60 were identified as studies on physical activity/exercise and QoL. None of those explicitly cited QoL models. In the 29 articles that had identifiable QoL measures over the 5 year period, the SF-36 was used 11 times, the similar RAND-36 four times, and several other measures, including the Satisfaction with Life Scale (SWLS; Diener et al. 1985) 1–2 times. An additional 29 articles that referred to subjective well-being and physical activity used even more diverse measures.

The most commonly used QoL measures in health promotion and physical activity interventions were developed primarily for clinical studies and do not emphasize positive health. In particular, the most widely used measure, the SF-36, assesses 8 health attributes, which were selected to represent those most frequently measured in widely used health surveys and thought to be most affected by disease and health conditions (Ware 2000; Ware and Sherbourne 1992). Although the SF-36 has proven useful, the SF-36 was designed for clinical purposes, did not emerge from a conceptual base, and does not reflect positive health.

The American College of Sports Medicine's (ACSM 2009) recent position stand on "Exercise and physical activity for older adults" summarizes evidence for benefits, including psychological

and QoL benefits. Although the position stand rightfully recommends physical activity, the evidence statement for QoL, “Although physical activity seems to be positively associated with some aspects of QOL, the precise nature of the relationship is poorly understood,” (p. 1522) is graded only “D”—the lowest level. Notably only one other evidence statement is graded D (flexibility), and most of the 29 statements are graded A/B. Inconsistent QoL assessment may well be a major reason for the low level of evidence. Sound, consistent measures of QoL require a clear, common understanding of the construct and a conceptual base.

Quality of Life Definition

Beginning with Rejeski et al.’s (1996) seminal review 15 years ago, the leading researchers in physical activity and health have noted major shortcomings in our conceptual models and measures of QoL, hindering both research and health promotion programs. Rejeski and Mihalko (2001) identified lack of precision in the definition of QoL as a barrier to consensus about the relationship between physical activity and QoL, and recommended theoretically-based research to advance our understanding. Similarly, McAuley and Elavsky (2006) argued that we cannot determine whether physical activity enhances QoL unless we can accurately operationalize and reliably measure this construct.

Recognition of the shortcomings of QoL conceptualization and assessment is not limited to the physical activity and health literature. As Fry (2000) noted, there is popular agreement about what constitutes QoL, but debate over a precise definition and measures. O’Connor (2004, p. 9) cites a number of definitions of QoL and HRQoL, and his summary description, patients’ subjective experience of their overall health state, is typical. Like many others, he connects QoL to health and refers to the World Health Organization (WHO) definition, “Health is a state of complete physical, mental, and social well-being, and not merely the absence of disease or infirmity,” which is found in the preamble to the 1946 constitution of the WHO (1946) and easily accessed at websites of WHO and many other health organizations. That definition, which reflects positive health and moves away from the traditional medical model, is the basis for most QoL definitions and measures.

Seligman (2008), citing the WHO definition and drawing on the positive psychology focus on mental health rather than mental illness, proposed that positive health reflects excellent status on biological, subjective, and functional measures. In Healthy People 2010 (USDHHS 2000), the widely-cited statement of national health objectives, the first goal is to help individuals of all ages increase life expectancy and improve their quality of life. Clearly for physical activity research and programs, and indeed in most health-related fields, the focus is on promotion of positive health and well-being.

However, as several QoL scholars have noted, a focus on health outcomes is limiting. Hsieh (2008) found that perceived health is not necessarily the most important factor in QoL, and

cautioned that many HRQoL measure are too limited to capture QoL. The most common definitions of QoL refer to a broad, integrative construct with multiple dimensions. For example, Galambos (1997) defined QoL as goodness of life related to perceived psychological, spiritual, sociocultural, biological and environmental well-being. Similarly, Marinelli and Plummer (1999) conceptualized QoL as comprising physical, social, emotional, intellectual, spiritual and environmental dimensions.

The scholarly literature on QoL suggests common themes. First, as suggested earlier, is the accent on positive health as an optimal state, not merely the absence of illness. Second, virtually all definitions and models describe QoL as multidimensional, including psychological and social as well as physical domains. Additionally, the most relevant definitions and models for physical activity and health refer to an integrative or holistic construct, and are based on subjective evaluations or perceptions. For example, Naughton and Shumaker (2003) described QoL as encompassing "those attributes valued by patients," highlighting the subjective nature of QoL, as well as its multidimensional nature.

Our working definition of QoL reflects positive health and is in line with previous literature and the WHO model. Specifically, quality of life is a subjective, multidimensional, integrative construct that reflects optimal well-being and positive health. However, that broad definition does not specify components and relationships, which are essential considerations in assessment, as well as in physical activity and health promotion research and practice. The existing research on physical activity and QoL does not provide any guiding theories or models, and thus, we look to the wider scholarship on QoL.

Quality of Life Conceptual Model

The WHO definition and related scholarship provide the elements of a conceptual framework for operational measures and research. The introduction to the WHOQOL measures defines quality of life as: an individual's perception of their position in life in the context of the culture and value systems in which they live and in relation to their goals, expectations, standards and concerns. It is a broad ranging concept affected in a complex way by the person's physical health, psychological state, personal beliefs, social relationships and their relationship to salient features of their environment (WHO 1998). That definition emphasizes perceptions and multiple dimensions, and also reflects a more complex, integrative view of QoL.

As several scholars have discussed, most QoL models are either "bottom-up" or "top-down." Bottom-up models, which are the base for most multidimensional measures, have multiple domains contributing to an overall or integrative QoL. In contrast, some scholars highlight the integrative QoL or life satisfaction construct and take the gestalt view that the whole is greater than the sum of its parts (e.g., Diener et al. 2000).

Several scholars (e.g., Gonzalez et al. 2006; Rojas 2006) have pointed out that both top-down and bottom-up approaches are limited, and that the relationships between life domains and integrative QoL are more complex. Gonzalez et al. (2010) recently expanded the bottom-up model by adopting an approach framed by complexity theories. They found that more complex models and non-linear approaches described the relationships between life domains and overall life satisfaction better than linear models. As Gonzalez et al. note, complex systems have multiple components that interact in dynamical ways and change over time.

Kelley-Gillespie (2009) recently synthesized the literature on QoL and presented an integrated conceptual model of QoL for older adults. She noted the lack of consensus on models and measures, despite the widespread recognition of the role of QoL for older adults, and highlighted the importance of going beyond physical health-related domains and the medical model approach. Her conceptual model includes the six major life domains (social, physical, psychological, cognitive, spiritual and environmental), but emphasizes the integrative and holistic nature of QoL.

Both Kelly-Gillespie's model and the WHO definition of QoL reflect the typical bottom-up approach to QoL assessment, but also reflect recognition of more integrative and complex relationships. We also recognize the complexity in QoL models and relationships, although our working model began as a bottom-up model. Like Kelly-Gillespie and the WHO model, we conceptualize QoL as integrative with similar domains contributing to an integrative subjective well-being. We do not assume that multiple domains necessarily contribute to integrative QoL in a linear, additive fashion, and we recognize that relationships are dynamic and likely to change over time and contexts.

Quality of Life Assessment for Physical Activity and Health Promotion

"Good" psychological measures are not only conceptually-based, but relevant to the target population and setting, and relevance for physical activity and health promotion is a key criterion in this project. That is, our QoL assessment must tap domains of QoL that are relevant to, or valued by, our target population—individuals who might benefit from lifestyle physical activity; and our measure must include QoL components likely to be related to physical activity.

In our initial model (Fig. 1), we included the domains commonly identified in the QoL literature: physical, social, emotional, cognitive and spiritual, as well as integrated QoL, which are all relevant to physical activity and health promotion. Clearly physical well-being is a key component. Considerable research (e.g., McAuley and Elavsky 2006; Lox et al. 2010) confirms the logical connections between physical activity and perceived physical health. Research also suggests that functional physical health, or the ability to do activities of daily living, is influenced by physical activity and particularly relevant to QoL for older adults. Thus, we

allowed for the sub-division of the physical domain into physical health, fitness and function in our initial model.

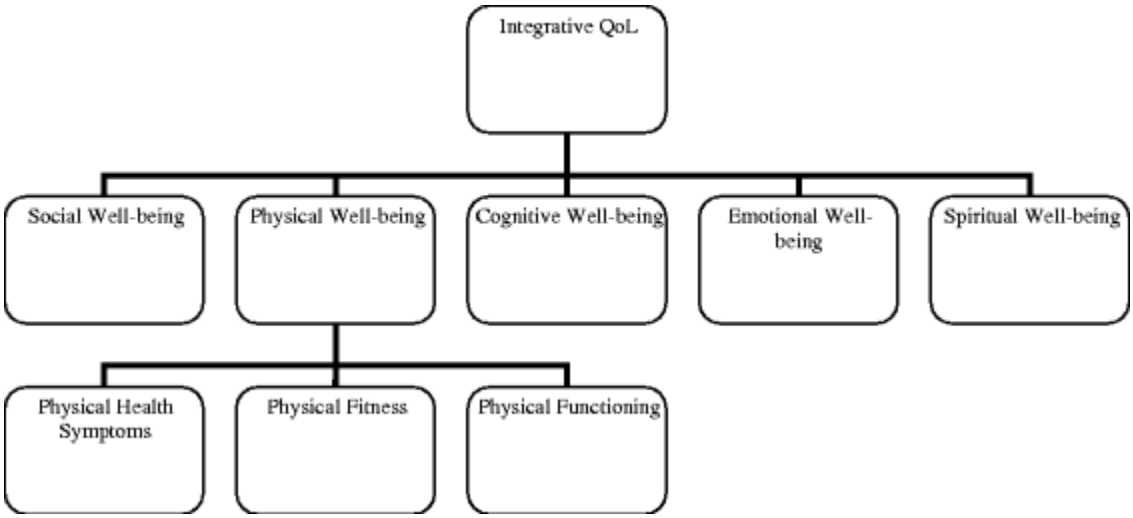

Fig. 1 Initial conceptual model of quality of life

A substantial body of literature also supports the relationship of physical activity to psychological health, although that research seldom uses QoL measures. Physical activity is associated with emotional well-being, particularly positive mood states and reduced negative affect (Lox et al. 2010). Moreover, a rapidly expanding body of research supports a relationship between physical activity and cognitive function (e.g., Colcombe and Kramer 2003; Lox et al. 2010), prompting us to separate cognitive well-being from emotional well-being in our model and measure. There is less empirical evidence for the physical activity—social well-being relationship, but anecdotal reports and program evaluations often suggest that participants in activity programs value the social connections.

A recent meta-analysis of exercise interventions and quality of life (Gillison et al. 2009) found support for positive effects of exercise on overall QoL as well as physical and psychological domains, although the effect sizes were small to moderate and varied across populations and intervention conditions. Notably, inconsistent measures limited the analysis and precluded consideration of all relevant domains; Gillison et al. (2009) reported a small improvement in social well-being with exercise intervention, but only a few studies in the meta-analysis had reported on social QoL.

Spiritual well-being is an intriguing domain that has not been investigated in relation to physical activity. However, the spiritual domain is essential in the conceptualization of QoL. With growth of physical activity programs in faith communities and increasing popularity of mindful exercise, this relationship is of interest. The environmental domain is not included in our model as it seems quite different from the other domains and less relevant to physical activity. We did, however, include environmental items in the initial measure.

Findings from an earlier study showing that physical activity levels were stronger predictors of health and well-being than was chronological age (Gill et al. 1997) provide some support for our QoL model. Interview findings with a sub-sample (Gill et al. 2003) indicated that enhanced quality of life was a key benefit of physical activity. Most of the older women in that study cited physical benefits, such as weight management, cardiovascular health, mobility and stamina. Nearly as many cited psychological values, particularly enjoyment and maintaining cognitive function, and some cited social and spiritual values. Notably, nearly all the women cited both physical and psychological values, and many referred to integrated physical/mental health. Their responses reflect the QoL model that is the starting point for the current research.

Research Overview

The purpose of this research is to develop a measure of QoL that reflects our conceptual model and is relevant for physical activity and health promotion programs. The research was conducted in three phases over 4 years. The first phase involved the development of the model and preliminary measure, which was circulated to a panel of evaluators and pilot-tested with a small sample. Following revisions, the initial QoL measure was administered to multiple samples of university students and adults in community programs. In phase 2, exploratory factor analyses and reliability analyses were conducted to determine the structure, and initiate psychometric analyses. In phase 3, confirmatory factor analysis was used to identify the best-fitting model, internal consistency was examined, and QoL scores were compared with measures of physical activity and satisfaction with life to provide initial validity information.

Phase 1: Development of Model and Preliminary Measure

QoL Item Development

Our initial model with QoL domains (physical, social, emotional, cognitive, spiritual) contributing to an overall integrative QoL provided the guiding framework, but items and sub-scales that extended beyond the model were considered in the initial item development phase. The goal was to make sure that we included multiple items to comprehensively cover all components of the model, but also to include other items that might reflect QoL in any way. The development of the items and draft measure was a gradual process; the research team met several times over the course of the year to organize a literature search, review search results, review articles, develop a working model, and gather related measures.

First, all items that reflected overall QoL or any domain in any way were compiled into a list. The research team reviewed existing QoL measures, including the widely used SF-36, (WHO

1998), SWLS (Diener et al. 1985), Myers and Sweeney's (2004) Wheel of Wellness and Ferrans and Powers's (1985) Quality of Life Index to identify potential items. Each research team member separately sorted items from all measures into model categories, listed items that did not fit the model categories, and also developed added items. The research team then met several times to review the separate lists, resolve domain classification disagreements, add and revise items, and make sure the overall measure and each subscale was comprehensive. At this point, only items that were obviously repetitive were dropped. Through several revisions, a draft measure that included multiple items for all relevant QoL domains was developed. The team also developed instructions and a response format for the measure. The resulting list included at least nine items in each of the social, physical, cognitive, emotional, spiritual and integrated QoL domains, and also included items in an added environmental category. Those 75 items were developed into a draft measure for panel review.

Panel Review and Pilot Testing

The draft version was circulated to a panel of five judges, including graduate students and instructors in kinesiology and health promotion, along with a description of the model and the proposed instructions for the measure. The judges were asked to rate each item twice, once for content (fitting the QoL definition and domain) and once for clarity, using a 3-point scale (Yes, Maybe, No) for each, and they also provided suggestions for revisions. The ratings were compiled and reviewed by the research team. Nearly all items were rated as having appropriate content and clear by all judges and few suggestions were made. The only suggestion was to remove repetitive items, and no items were rated inappropriate or unclear. The research team reviewed the judges' ratings, other measures and literature, and made revisions including deleting five repetitive items, minor wording changes (e.g., spiritual belief to spiritual beliefs) on a few items, and made sure each domain was accurately and comprehensively represented. The 70 items on the initial Quality of Life Survey included 5 environmental items and at least 8 items in each of the other domains (integrated, social, spiritual, emotional, cognitive and physical).

The items from the different domains were rotated throughout the measure, and the instructions asked respondents to rate each item on a 1–5 scale (1=poor; 5=excellent) following the stem: "How would you rate the quality of your...." The initial survey was administered to a pilot sample ($n = 14$) in an exercise psychology graduate class. The investigator explained the purpose of the study (developing a measure of quality of life), ensured confidentiality and followed all human subjects procedures in asking for volunteers. All in the class volunteered and provided signed informed consent separate from the measure. They were encouraged to note unclear items and add comments as they completed the measure, which was returned in a large envelope. No suggestions were made, and pilot testing suggested the measure was easily completed in 15 min. Based on the judges' panel and pilot results, as well as further review by the research team, phase 1 provided a 70-item QoL Survey that fit the conceptual model.

Phase 2: Initial Item Analysis and Exploratory Factor Analysis of QoL Measure

The initial 70-item Quality of Life Survey was administered along with measures of physical activity to samples of university students and participants in community programs to examine the factor structure and to begin to establish psychometric properties. Analyses include internal consistencies, item analyses and descriptive analyses of the QoL subscales as well as correlations with physical activity measures. Exploratory factor analyses (EFA) were used in this phase to examine the factor structure.

Participants

Recruiting and data collection took place over a year and involved multiple samples from university classes as well as from community programs. University samples were predominantly from Fitness for Life classes. The non-student samples came from several different sites including community recreation and church-based activity programs, senior activity programs, YWCA/YMCA, TOPS, square dance club, boxing club and an activity program for those with fibromyalgia. All participation was voluntary, all data were confidential and no names were included on surveys. The PI contacted instructors and program directors in advance to seek permission to contact participants. Upon receiving that permission, arrangements were made to meet with the group at a program session to ask for volunteers. In all cases participants were informed of the purpose of the research—to develop a valid, relevant measure of quality of life—and signed an informed consent form that was separately returned.

The total sample ($n = 364$) was approximately two-thirds female (65.7%) and from university classes (68.1%). The sample was predominantly white/Caucasian (69.6%) with a significant number of African-Americans (24.1%) and small numbers of Native American (.9%), Asian (2.9%), Hispanic (1.4%) and “other” racial/ethnic identity (1.2%). The mean age was 35.1, ranging from 18 to 89; about 60% were in the 18–22 age range with others spread out over the older ages.

Measures

The primary measure was the initial 70-item QoL Survey developed in phase 1, which included items representing integrated, social, emotional, cognitive, spiritual, physical and environmental QoL. The survey packet also included the Satisfaction with Life Scale (SWLS). This 5-item measure is the most recognized and established measure of subjective well-being, and as Diener et al. (1985) and several other researchers have suggested, it seems to reflect integrative QoL.

Given our interest in the relationship between physical activity and QoL, we assessed physical activity stage using the Exercise Stages of Change-Short Form (Marcus et al. 1992). We also used the short form of the International Physical Activity Questionnaire (IPAQ). The IPAQ was developed for population surveillance, and validity and reliability have been demonstrated in international research (Craig et al. 2003). The IPAQ measures, background, guidelines and scoring protocols are available at the IPAQ website: http://www.ipaq.ki.se/ipaq.htm. The IPAQ asks respondents to indicate how much they have been physically active over the last 7 days in vigorous activities, moderate activities and walking. Those scores are weighted to determine total MET-minutes/week.

Internal Consistency and Correlational Results

The demographic characteristics of the sample (n = 364) were described in the previous section. Descriptive results on the physical activity measures indicated the sample was relatively active. Most (77.6%) were in the action or maintenance stage and IPAQ total MET-minutes/week (M = 4,729.3, SD = 5,459.4) were also relatively high, although quite variable.

In this phase, we included all 70 items with their respective scale to examine internal consistency and calculate total scores for each QoL scale. All QoL domain scales identified in our model demonstrated high internal consistency (α values range .87 to .92) and all items contributed to their respective scale. Environmental QoL was slightly less consistent (α = .75). All QoL scale scores were moderately correlated with each other (.43–.88). Generally, integrated QoL had the highest correlations with other QoL scores and spiritual QoL had lower correlations with other QoL scores.

Internal consistencies as well as correlations of QoL with SWLS and physical activity scores are given in Table 1. SWLS was significantly correlated with all QoL scores at low to moderate levels. The highest correlation was with integrated QoL (r = .425). Correlations of QoL scores with physical activity stage, as well as with IPAQ MET-minutes/week, were moderate with physical QoL and at significant but lower levels with a few other QoL scores.

Table 1

Phase 2 internal consistencies and correlations

QoL Scale	# items	Mean (SD)	Alpha	r with SWLS	r with PA stage	r with IPAQ MET
Integrated	10	38.7 (6.16)	.919	.425	−.188	.282

QoL Scale	# items	Mean (SD)	Alpha	r with SWLS	r with PA stage	r with IPAQ MET
Social	12	47.0 (6.96)	.891	.344	−.125[a]	.205
Spiritual	10	37.5 (7.56)	.924	.270	−.077	.111[a]
Emotional	12	44.6 (7.57)	.916	.378	−.101	.221
Cognitive	8	30.1 (4.62)	.870	.177	−.073	.254
Physical	13	48.6 (7.92)	.905	.376	−.362	.324
Environmental	5	18.8 (2.90)	.745	.244	−.155	.212
Mean (SD)				25.4 (5.57)	1.68 (.91)	4,729.3 (5,459.4)

All correlations greater than .13 significant at $p < .01$; correlations below .11 are non-significant

[a]Correlation significant at $p < .05$

The reliability and correlational analyses indicate good internal consistency for the QoL scales and support expected relationships. However, the overall measure is long and most scales have similar, repetitive items that may not be needed. Exploratory factor analyses were used to aid in reducing the scale as well as to clarify the factor structure.

Exploratory Factor Analyses

Exploratory factor analyses were used with data from the phase 2 sample (n = 364). The initial principal components analysis with varimax rotation yielded 11 factors with eigenvalues over 1.00. The scree plot leveled off around 6 factors, with little added variance explained. Thus, added EFA were run with forced 6-factor and 7-factor solutions. In the 11-factor solution, the first 5 factors, which accounted for 58.2% of the variance, clearly reflected emotional, physical,

cognitive, spiritual and social QoL. Each factor had at least 5 items with factor loadings over .50, and most relevant loadings were much higher. None of the other factors had more than one or two items with high loadings. Factor 6 included two environmental items. Factor 7 had no high loading items but “friend to others” and “worthwhile person” loaded around .45. Factors 8, 9 and 10 all had one item with high loadings—“support from others,” “creativity” and “sleep,” respectively. Factor 11 had no items loading over .40.

Both the 6-factor and 7-factor solutions yielded factor loading patterns that were similar to the 11-factor solution, and all matched the conceptual model well. At least 5 items clearly loaded together on a single factor in all solutions (6, 7 or 11-factor) for social, spiritual, cognitive and emotional factors. At least 5 items also loaded clearly on the physical factor, but items related to activities of daily living (ADL) split away from the physical factor to form a separate factor. Items related to integrated Qol did not clearly load onto a single factor in any of the solutions. However, integrated QoL items did have high loadings on at least one factor, most often the emotional factor, and also cross-loaded with other factors. (EFA results for the 6-factor solution with all items are on Table 2; other factor analysis results are available from the first author).

Table 2

Phase 2 EFA 6-factor solution rotated component matrix

Item	1 (Soc)	2 (Cog)	3 (Phy)	4 (Spir)	5 (Emot)	6 (ADL)
Q1	.132	.206	.807	.038	.224	.033
Q2	.537	.266	.416	.099	.227	−.037
Q3	.243	.239	.203	.612	.384	−.129
Q4	.461	.280	.314	.274	.529	−.060
Q5	.205	.495	.363	.167	.278	−.034
Q6	.077	.114	**.852**	.058	.184	.011
Q7	.174	.332	.468	.161	.324	.047
Q8	**.716**	.075	.173	.157	.229	.033

Item	1 (Soc)	2 (Cog)	3 (Phy)	4 (Spir)	5 (Emot)	6 (ADL)
Q9	.542	.311	.152	.200	.335	.085
Q10	.306	.565	.050	.069	.059	−.141
Q11	.231	.535	.268	.042	.086	.155
Q12	.077	.208	.793	.049	.223	.138
Q13	.577	.057	.102	.098	.126	.204
Q14	.431	.223	.178	.236	**.618**	.073
Q15	.587	.226	.123	.094	**.569**	.121
Q16	.075	**.672**	.085	.027	.206	.066
Q17	.100	.092	**.878**	.048	.085	.028
Q18	.016	.047	.210	.157	.407	.245
Q19	*.419*	.298	*.406*	.162	*.412*	.199
Q20	.475	.472	.171	.114	.000	.121
Q21	.182	.082	−.031	.825	−.037	.102
Q22	.368	.341	.189	.076	.317	.326
Q23	.212	**.688**	.126	.148	.234	.208
Q24	.117	.208	.099	.047	.245	.534
Q25	.382	.459	.023	.026	.248	.247
Q26	*.559*	.297	.093	.095	.381	.350
Q27	.342	−.023	.130	.061	.176	.441

Item	1 (Soc)	2 (Cog)	3 (Phy)	4 (Spir)	5 (Emot)	6 (ADL)
Q28	.386	.279	.129	.156	**.642**	.266
Q29	.471	.091	.156	−.006	.375	.330
Q30	.367	.220	.461	−.015	.300	.216
Q31	.279	.307	.224	.187	.224	**.497**
Q32	*.490*	.248	.271	.171	*.425*	.361
Q33	**.605**	.037	.205	.122	.154	.075
Q34	.106	.042	.056	**.832**	.168	−.013
Q35	.231	.481	.190	.191	.317	.233
Q36	.258	.393	.372	.048	.117	**.426**
Q37	.143	.282	.077	.124	.116	.528
Q38	.531	.405	.040	.138	.127	.201
Q39	*.564*	.292	.225	.139	*.476*	.265
Q40	**.657**	.302	.164	.158	.105	.131
Q41	.163	.103	.057	**.856**	.174	.025
Q42	.403	.395	.129	.140	**.485**	.186
Q43	.223	**.728**	.162	.062	.127	.197
Q44	.036	.198	.663	.007	.194	.300
Q45	.233	.490	.256	.010	.063	.478
Q46	.316	.234	.583	.167	.344	.227

Item	1 (Soc)	2 (Cog)	3 (Phy)	4 (Spir)	5 (Emot)	6 (ADL)
Q47	**.701**	.248	.084	.202	.152	.075
Q48	.001	.100	.065	.887	.116	.151
Q49	.257	.384	.258	.228	**.530**	.071
Q50	.237	.083	**.764**	−.007	−.068	.075
Q51	.206	.414	.573	.038	.016	.207
Q52	.531	.396	.344	.150	.318	.188
Q53	.494	.455	.237	.156	.033	.108
Q54	.518	.347	.201	.123	.063	.300
Q55	.155	.081	.075	**.910**	.105	.087
Q56	.359	.488	.310	.078	.222	.248
Q57	.005	**.619**	.177	.000	.243	.137
Q58	.285	.115	**.683**	.070	−.101	.134
Q59	.438	.450	.182	.075	−.019	.203
Q60	.528	.471	.230	.138	.115	.195
Q61	**.718**	.274	.157	.095	.082	.253
Q62	.186	.059	.000	**.863**	.079	.140
Q63	.203	.464	.199	.251	.503	.094
Q64	.116	**.687**	.245	.179	.097	.242
Q65	.139	.108	**.791**	.045	.116	.172

Item	1 (Soc)	2 (Cog)	3 (Phy)	4 (Spir)	5 (Emot)	6 (ADL)
Q66	.420	.433	.390	.118	.193	.085
Q67	.456	.276	.053	.120	−.100	.442
Q68	.300	.568	.135	.047	.062	.358
Q69	.286	.350	.170	.365	−.037	.138
Q70	.248	.182	.310	.083	−.006	**.552**

Factors are labeled with identified dimension (Soc, Cog, Phy, Spir, Emot, ADL) and items identified with that factor are underlined and bolded. Integrated items and loadings are italicized (Q19, Q26, Q32, Q39). Two items originally considered spiritual consistently loaded with the Emotional factor (Q14, Q28)

Environmental items did not clearly form a factor, and several items were problematic (e.g., older participants omitted the work/school environment item). Two environmental items—"living space" and "neighborhood"—loaded with the ADL items in the 6-factor and 7-factor solutions. However, environmental QoL is different conceptually from the QoL domains. We firmly believe the environment is related to QoL, and it may well be important to assess environmental quality, but environmental QoL is not consistent with our conceptual model. Thus, in consideration of the conceptual model, as well as the EFA results, we dropped environmental QoL from the measure.

We re-ran the EFA without the environmental items and the resulting factor matrix was similar to the solutions with all items. Emotional, physical, spiritual, cognitive and social items clearly loaded on their respective factors, and a separate factor included the 3 ADL items. Notably, these two items are the "body" items (bodily appearance and body shape). The patterns and loadings were nearly identical to the 6 and 7-factor solutions with all items, although the order of the factors varied.

Overall, the EFA results suggest clear social, emotional, cognitive, spiritual and physical factors, along with a separate ADL factor. Although integrated QoL did not form a clear separate factor, integrated items loaded on several factors. The cross-loadings and close connection with emotional QoL are consistent with conceptualizations of integrative QoL in the literature. Thus, we considered integrated QoL, as well as the other six QoL domains in moving to confirmatory factor analyses in phase 3.

Phase 3: Confirmatory Factor Analyses and Initial Validity Evidence

Phase 3 is a continuation of phase 2, rather than a separate study. Phase 3 includes the same samples, measures and procedures. However, for phase 3 data collection was extended to additional classes and programs. The total sample for phase 3 (n = 512) includes all participants in phase 2, and the profile is nearly identical. Specifically, the expanded sample is approximately two-thirds female (67.5%) and from university classes (68%). Again the sample is predominantly white (63%) with a significant proportion of African-Americans (30.8%) and small numbers of other racial/ethnic groups. The age range (18–89) and distribution is the same as in phase 2.

Based on the EFA results and our conceptual model, we used confirmatory factor analyses (CFA) to examine and refine the factor structure of the QoL measure. Then, internal consistencies were examined and QoL scores were compared with SWLS and physical activity scores.

Confirmatory Factor Analysis Results

The main proposed 7-factor model included the QoL domains in our model (social, emotional, cognitive, physical, spiritual and integrated QoL) with ADL separate from the physical domain. We also considered a single-factor QoL solution and a 6-factor model without integrated QoL as alternatives. As well as identifying the factor structure, we also aimed to reduce the 70-item measure to a more appropriate length while still capturing the domains of QoL. The EFA results were used to identify 5–6 items with clear loadings for each domain, with three items related to ADL.

Generally items suggested by EFA results fit the QoL domains and model well. Five items were identified easily for social, emotional, cognitive and spiritual domains. With physical QoL we initially included “energy level” and “freedom from physical health problems” but those did not fit well and were dropped. We also examined physical QoL including the ADL items, but separating into physical and ADL domains proved the better fit. Also, within physical QoL, a modification allowing the two body items to correlate provided a better fit. Summary statistics for the single factor, 7-factor and 6-factor (no integrated QoL) models are presented in Table 3.

Table 3 Phase 3 confirmatory factor analysis results

Model	χ^2	**df**	**CFI**	**SRMR**	**RMSEA**	**(CI)**
Single-factor	8,240.23	469	.86	.25	.18	(.18; .18)

Model	χ^2	df	CFI	SRMR	RMSEA	(CI)
7-factor	1,259.01	442	.98	.047	.06	(.056; .064)
6-factor	925.13	334	.98	.047	.059	(.054; .063)

The single factor model was not a good fit, suggesting that QoL is indeed multidimensional. Both the 6-factor and 7-factor solutions provided similar good fits. Although the $\chi 2$ values are significant, the $\chi 2$ /df ratio is less than 3 for both models. All other statistics, including CFI > .95, and RMSEA between .05 and .08 indicate good fits, in line with accepted standards (e.g., Hu and Bentler 1999).

Internal Consistency and Correlational Results

Internal consistencies were examined and QoL scores were calculated for each domain. All scales showed good internal consistency with $\alpha > .85$ for all but ADL, which had $\alpha = .76$. In all cases, all item-total correlations were over .60 and all items contributed to the internal consistency. QoL scores correlated with each other significantly and positively, at moderate levels ranging from a low of .139 for physical and spiritual to a high of .699 for integrated and emotional. Generally, integrated correlated higher with other scores and spiritual correlated at lower levels.

Internal consistencies and correlations of QoL scores with SWLS and the physical activity measures are in Table 4. SWLS, which reflects subjective well-being, was significantly and moderately correlated with all QoL scores, providing initial concurrent validity evidence. Given previous research suggesting that physical activity is related to QoL, positive correlations were expected with physical activity measures. Correlations were positive, but generally low and not all were statistically significant. Notably, physical QoL correlated moderately with IPAQ MET-minutes/week, as well as PA stage. Physical activity measures also correlated with ADL, and correlated significantly with integrated, emotional and cognitive QoL at low levels.

Table 4

Phase 3 internal consistencies and correlations

QoL Scale	# items	Mean (SD)	Alpha	r with SWLS	r with PA stage	r with IPAQ MET

QoL Scale	# items	Mean (SD)	Alpha	r with SWLS	r with PA stage	r with IPAQ MET
Integrated	4	15.0 (3.42)	.901	.389	−.059	.175
Social	5	19.2 (4.09)	.869	.369	−.038	.135
Spiritual	5	18.7 (5.84)	.949	.164	−.027	.046
Emotional	5	18.2 (3.83)	.901	.413	−.088	.132
Cognitive	5	18.5 (3.18)	.848	.236	−.147	.189
Physical	5	17.6 (4.14)	.899	.319	−.449	.296
ADL	3	12.6 (1.99)	.762	.312	−.169	.162
Mean (SD)				25.47 (5.62)	1.76 (.96)	4,729.3 (5,459.4)

All correlations greater than .12 significant at $p < .01$; correlations below .10 are non-significant

Our sample was about two-thirds university students, although our target population is the broader community population. To partially check on whether our results might be skewed toward students, we compared the student and non-student community participants on QoL and physical activity scores, and examined correlations separately for the two groups. The MANOVA on the 7 QoL scores revealed a significant but small, $F\ (7, 462) = 6.68$, $p < .001$, $\eta^2 = .09$, group difference. Univariate differences were significant for spiritual QoL, which was the strongest difference, $F\ (1, 468) = 18.41$, $p < .001$, $\eta^2 = .038$, and also significant ($p < .05$) for physical and ADL. Community participants were higher on spiritual QoL ($M = 20.40$) than were students ($M = 17.89$); students were slightly higher than community participants on both physical ($M = 17.90$ v 17.04) and ADL ($M = 12.75$ v. 12. 25). MANOVA comparisons on physical activity scores revealed no significant group differences between the two groups. Examining the correlations between QoL scores and physical activity measures revealed nearly identical patterns for both groups. As in the total sample, correlations between QoL and physical activity scores were relatively low, but some were significant, including correlations with physical and ADL QoL.

Discussion

The long-term goal of this research is to develop a measure of QoL that is reliable, valid and relevant for physical activity and health promotion programs. The resulting 32-item QoL Survey (see Appendix) fits the conceptual model and has sufficient psychometric properties to recommend its use in research and health promotion programs. Given the lack of conceptually-based, psychometrically-sound QoL measures that emphasize positive health and relevance for physical activity and health promotion programs, this QoL Survey fills an important gap in the literature.

Throughout this project, we have considered the conceptual base of QoL and relevance for physical activity and health promotion rather than relying solely on statistical analyses. The existing scholarly work converges on a conceptualization of QoL that is subjective, multidimensional and integrative, and reflects positive health. That work prompted our conceptual model with social, emotional, physical, cognitive and spiritual QoL contributing to an integrated QoL. The resulting QoL Survey is consistent with that model and with the existing scholarly work on physical activity and QoL. All the statistical analyses, including confirmatory factor analyses, clearly indicate that QoL is multidimensional with clear social, emotional, cognitive, physical and spiritual components. These are the dimensions of QoL consistently recognized in research on QoL as well as in existing measures.

The separation of ADL QoL from physical QoL in the current research is logical and relevant to physical activity and QoL research and programs. Given our focus on physical activity and health, it seems useful to consider ADL QoL or functionality separate from physical QoL in research and programs, particularly those with older adults.

In the current results, an integrated QoL factor was not clearly separated from others. In some ways, cross loadings, overlap and the lack of a clear, separate factor fits the concept of an integrative QoL, as well as non-linear and complexity-based approaches. That is, integrated QoL is the overall perception of one's subjective well-being, and that subjective perception is influenced by multiple, dynamically changing contributing factors. Sources of integrated QoL may well vary in salience among people as well as over changing times and conditions. The items associated with integrated QoL in this research fit that conceptualization and held up in the confirmatory factor analyses. However, given that the fit of the models with and without integrated QoL were similar, the CFA results did not clearly support a hierarchical model with other QoL domains leading to integrated QoL. Thus, the relationship of integrative QoL to other domains remains an open question, and one that likely involves complexity. We recommend continuing assessment of integrated QoL as well as other QoL dimensions to investigate relationships among QoL dimensions, and to investigate the relationship of physical activity with QoL over time and in relation to interventions.

Limitations and Directions

Clearly this research has limitations, and further work is needed to refine the measure and examine validity and relevance. The current research is limited in scope and methodology. Our sample was limited to a geographic region and included a large proportion of university students. As a partial check, we compared the university students and non-student community participants and found few differences across groups, with all correlations nearly identical. Still, a more representative sample of our larger target population of potential community program participants would have been desirable.

Further research with our QoL measure may lead to revisions, and further research is needed to establish validity. Still the current results suggest adequate psychometric properties for continuing research. Unlike other existing QoL measures, our QoL measure fits a positive health model that is relevant for physical activity and health promotion research and practice. We plan to continue refining this QoL measure in our own research, and also extend that research to examine changes in QoL in relation to physical activity interventions and programs. We also invite others to use our QoL measure, and welcome suggestions that will advance QoL assessment and promote positive health through physical activity.

Acknowledgments

Portions of this research project were funded in part by a Community-Based Research Grant from the University of North Carolina at Greensboro, an Undergraduate Research Assistantship from University of North Carolina at Greensboro, and the Safrit Measurement Award from the University of North Carolina at Greensboro.

Appendix

QoL Survey Scales and Related Items

Social (5 items)

Q8 Personal Relationships

Q33 Intimate relationships

Q40 Ability to initiate and maintain relationships

Q47 Emotional relationships with others

Q61 Social relationships

Spiritual (5 items)

Q34 Prayer, meditation, or individual spiritual study

Q41 Spiritual growth

Q48 Spiritual belief

Q55 Spiritual life

Q62 Faith

Emotional (5 items)

Q14 Peace of mind

Q15 Feeling of happiness

Q28 Sense of calm and peacefulness

Q41 Sense of NOT feeling sad, blue, or depressed

Q49 Sense of NOT feeling worried, tense or anxious

Cognitive (5 items)

Q16 Ability to concentrate

Q23 Ability to think

Q43 Ability to solve problems

Q57 Memory

Q64 Ability to continue learning

Physical (5 items)

Q6 Physical health and well-being

Q17 Physical fitness

Q50 Body shape

Q58 Bodily appearance

Q65 Level of physical activity

ADL (3 items)

Q36 Ability to do activities of daily living

Q31 Ability to take care of yourself

Q70 Ability to get around

Integrated (4 items)

Q19 Overall quality of life

Q26 Enjoyment of life

Q32 Life in general

Q39 Happiness in general

Note. The numbers (Q8, etc) are the item numbers from the 70-item survey. The following page presents the resulting 32-item QoL Survey with the instructions and response options.

Quality of Life Survey—Version 2

This questionnaire asks how you feel about your quality of life , including your physical, emotional, social, spiritual and mental health and well-being. Please answer all questions. There are no right or wrong answers. Use the 1–5 scale below and circle the one number that best describes how you feel about your quality of life.

Poor	Below Average	Average	Above Average	Excellent
1	2	3	4	5

*How would you rate the **quality** of your…*

	Poor	Below Average	Average	Above Average	Excellent
Physical health and well-being	1	2	3	4	5
Personal Relationships	1	2	3	4	5
Peace of mind	1	2	3	4	5
Feeling of happiness	1	2	3	4	5

Ability to concentrate	1	2	3	4	5
Physical fitness	1	2	3	4	5
Overall quality of life	1	2	3	4	5
Ability to think	1	2	3	4	5
Enjoyment of life	1	2	3	4	5
Sense of calm and peacefulness	1	2	3	4	5
Ability to take care of yourself	1	2	3	4	5
Life in general	1	2	3	4	5
Intimate relationships	1	2	3	4	5
Prayer, meditation, or individual spiritual study	1	2	3	4	5
Ability to do activities of daily living	1	2	3	4	5
Happiness in general	1	2	3	4	5
Ability to initiate and maintain relationships	1	2	3	4	5
Spiritual growth	1	2	3	4	5
Sense of NOT feeling sad, blue, or depressed	1	2	3	4	5
Ability to solve problems	1	2	3	4	5
Emotional relationships with others	1	2	3	4	5
Spiritual beliefs	1	2	3	4	5

Sense of NOT feeling worried, tense or anxious	1	2	3	4	5
Body shape	1	2	3	4	5
Spiritual life	1	2	3	4	5
Memory	1	2	3	4	5
Bodily appearance	1	2	3	4	5
Social relationships	1	2	3	4	5
Faith	1	2	3	4	5
Ability to continue learning	1	2	3	4	5
Level of Physical activity	1	2	3	4	5
Ability to get around	1	2	3	4	5

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